

IN THE SPECIFICATION:

**Please amend the Title as follows:**

CEMENT SLURRIES COMPRISING HYDROPHOBIC

HYDROPHOBIC/HYDROPHILIC AND HYDROPHILIC POLYMERS

**Please replace the paragraph beginning on page 3, line 13 with the following:**

According to a variant, the polymer can have a ~~molecular mass~~ weight ~~average molecular weight~~ ranging between  $10^4$  and  $10^7$  daltons and a proportion of hydrophobic units Hb ranging between 0.5 and 60%.

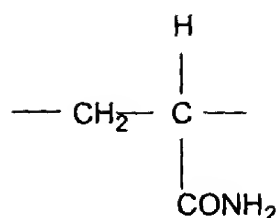
**Please replace the paragraph beginning on page 3, line 16 with the following:**

The polymer according to the invention can be selected from the group consisting of:

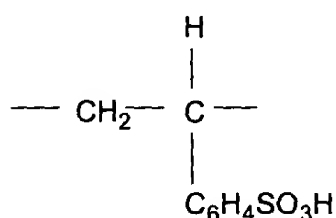
- HMPAM where R5 is H and Z1 is CONH2, R'5=CH3, Z2 is COOR'I with R'1=C9H19, and
- ~~— S1, S2 where Pa is H and Z1 is CONH2, R'5'H and Z2 is C6H4503H,~~
- Hbl where Pa is H, Z1 is COOH, R'5 is H and Z2 is COOR' 1 with R'I is C4.

**After the paragraph beginning on page 3, line 16 and before the paragraph beginning on page 3, line 22, please add the following:**

The polymer according to the invention may also be hydrophilic copolymers S1 and S2 having units of



and

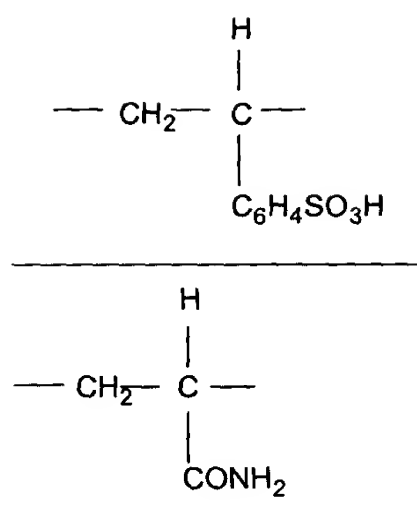


**Please replace the paragraph beginning on page 3, line 22 with the following:**

The mineral filler can consist of silica whose grain size ranges distribution range is between 5 and 200  $\mu\text{m}$  and microsilica whose grain size ranges distribution range is between 0.1 and 20  $\mu\text{m}$ .

**Please replace the paragraphs beginning on page 6, line 14 through page 7, line 3 with the following:**

- **HMPAM:** acrylamide (Hy)/nonyl methacrylate (Hb) copolymer, according to the description above, with  $R_5=\text{H}$ , Z1 is  $\text{CONH}_2$ ,  $R'_5=\text{CH}_3$ , Z2 is  $\text{COOR}'_1$  with  $R'_1=\text{C}_9\text{H}_{19}$ ; it can have a ~~molecular mass~~ weight average molecular weight of about ~~8406~~  $8 \cdot 10^6$  daltons and a hydrophobe (Hb) proportion ranging between 0.5 and 1.5 %;
- **S1, S2:** acrylamide (Hy)/styrene sulfonate (Hb) copolymers, branched or not, ~~according to the description above, where  $R_5$  is H, Z 1 is  $\text{CONH}_2$ ,  $R_4=\text{H}$ , Z2 is  $\text{C}_6\text{H}_4\text{SO}_3\text{H}$~~  having units of



and

and having a molar ratio of about 50/50 and a ~~molar mass~~ weight average molecular weight ranging between 500,000 and  $5 \cdot 10^6$  daltons. S1 is not branched, S2 is branched. The branching agent used is N,N' methylene bis acrylamide MBA;

- **Hb1**: acrylic acid (Hy)/butyl acrylate (Hb) copolymer, where R5 is H, Z1 is COOH, R'5 is H and Z2 is COOR'1 with R'1 being C4, comprising about 80 % ~~acrylate~~ acrylic acid units, and ~~of molecular mass~~ a weight average molecular weight ranging between  $10^4$  and  $5 \cdot 10^4$  daltons.

### **REMARKS**

In the Office Action of April 22, 2003, Claims 1 - 3, 5, and 8 - 10 were rejected. No claim was allowed. In the Amendment of August 25, 2003, Claims 1 - 3, 5 and 8 - 10 were canceled and new Claims 20 - 24 were added to the application. By an Advisory Action of September 25, 2003, the Examiner indicated that the Amendment of August 25, 2003 was not entered. In the present Amendment, Claims 20 - 24 are indicated as "not entered" and new Claims 25 - 29 are provided. Further, the specification is amended to overcome objections set forth in the Office Action of April 22, 2003 and the Advisory Action of September 25, 2003. The amendments to the specification show changes relative to the last entered amendment.

Reexamination and reconsideration are respectfully requested in view of the foregoing amendments and the following remarks.

### **New Claims**

As discussed below, the claims are amended to be directed specifically to the copolymers described in detail in the application. Claims 25 and 26 (identical to the non-entered Claims 20 and 21) are directed to a cement slurry containing a copolymer designated as HMPAM and having acrylamide/nonyl methacrylate units. Claim 27 is directed to a cement slurry containing a copolymer designated as Hb1 and having acrylic acid/butyl acrylate units. Claim 28 (identical to non-entered Claim 23) is directed to a cement slurry containing hydrophilic copolymers designated as S1 or S2 and having acrylamide/styrene sulfonate

units. Claim 29 (identical to non-entered Claim 24) is directed to a cement slurry containing HMPAM and S1 or S2.

Since the claims are directed to specific polymers, the chemical formulas are rewritten in the claims to replace generic substituents with specific substituents. It is respectfully submitted that no new matter is introduced into the application.

#### **Objections to the Specification**

The disclosure was objected to because of informalities. In particular, the Examiner alleges that the specification on page 3, line 20 still shows S1 and S2 as hydrophilic/hydrophobic copolymers. In response, the specification is amended to remove S1 and S2 as hydrophilic/hydrophobic polymers. Instead, an additional paragraph is added to define S1 and S2 as hydrophilic polymers

The disclosure was further objected to on the grounds that the particle size ranges of silica and microsilica overlap. In response, the disclosure is amended to define silica and microsilica in terms of their particle size distribution ranges.

It is respectfully submitted that silica and microsilica are recognized by persons skilled in the art as being distinct ingredients, despite any incidental overlap in size ranges. For example, persons skilled in the art would understand that silica and microsilica each have a Gaussian distribution of particle sizes within their respective size ranges, with silica having a grain size distribution centered at about 100  $\mu\text{m}$  (roughly the middle of the 5 - 200  $\mu\text{m}$  size range) and microsilica having a grain size distribution centered at about 10  $\mu\text{m}$  (roughly the

middle of the .1 to 20  $\mu\text{m}$  size range).

Accordingly, it is respectfully submitted that the objections to the specification are thereby overcome.

**Rejection of Claims 1 - 3, 5 and 8 - 10 under 35 U.S.C. 112, first paragraph:  
written description**

Claims 1 - 3, 5 and 8 - 10 were rejected under 35 U.S.C. 112, first paragraph, as allegedly containing subject matter that is not described in the specification in such a way as to enable one skilled in the art to make and use the invention. In view of the Declaration of Mr. Muller submitted with Applicant's previous response, the Examiner required that the specification and claims be amended to refer to weight average molecular weights of the polymers instead of molecular masses.

In response, the specification is amended to replace "molecular mass" with "weight average molecular weight" as required by the Examiner. The term "weight average molecular weight" is used in the new claims. It is respectfully submitted that the substitution of the term "weight average molecular weight" for "molecular mass" in the specification and claims is not new matter in view of the previously submitted Declaration under 37 CFR 1.132 of Guy Muller, wherein he declares that the typical practice in the art of well fluid additives is to measure the average molecular weight of polymer additives as a weight average and that therefore, persons skilled in the art of well fluid additives, upon reading the specification, would understand, based on the contents of the specification and

the typical practice in the art, that the average molecular weight mentioned in the application was the weight average.

Accordingly, it is respectfully submitted that this rejection is thereby overcome.

**Rejection of Claims 1 - 3, 5 and 8 - 10 under 35 U.S.C. 112, first paragraph**

Claims 1 - 3, 5 and 8 - 10 were rejected under 35 U.S.C. 112, first paragraph, as allegedly containing subject matter that is not described in the specification in such a way as to enable one skilled in the art to make and use the invention. The Examiner alleges that there is no hydrophilic/hydrophobic copolymer shown in the specification that has a weight average molecular weight of 500,000. The Examiner further state that claims directed to a weight hydrophilic/hydrophobic copolymer with a weight average molecular weight of 500,000 is new matter.

In response, new claims 25 - 29 define the weight average molecular weight of each particular polymer as it is designated in the specification. (In the case of the copolymer designated as "HMPAM", the disclosure in the specification that the weight average molecular weight is  $8 \cdot 10^6$  is taken in conjunction with the general disclosure that polymers of the present invention have an upper limit of  $10^7$ .)

**Rejection of Claims 1 - 3, 5 and 8 - 10 under 35 U.S.C. 112, s c nd**

**paragraph: indefiniteness**

Claims 1 - 3, 5 and 8 - 10 were rejected under 35 U.S.C. 112, second paragraph, as allegedly being indefinite. The Examiner notes that the particle sizes of silica and microsilica overlap and questions where silica having a particle size of 5 - 20 microns belongs. The Examiner further states that the term molecular mass is indefinite.

In response, in new Claims 25 - 29, there is not a limitation directed to microsilica. Further, the term "weight average molecular weight" is used instead of "molecular mass."

It is respectfully submitted that this rejection is thereby overcome in new Claims 25 - 29.

**Rejection of Claims 1 - 3, 5 and 8 - 10 under 35 U.S.C. §103(a) over Lynn or Yamato in view of Koga et al, or Yamaguchi et al, and further in view of Audibert or Argillier**

Claims 1 - 3, 5, 6 and 8 - 10 were rejected under 35 U.S.C. §102(b) as anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Lynn (U.S. Patent No. 4,525,500) or Yamato et al (U.S. Patent No. 5,707,445) in view of Koga et al (U.S. Patent No. 4,662,942) or Yamaguchi et al (U.S. Patent No. 4,888, 059), or in view of Audibert or Argillier.

This rejection is respectfully traversed as it may be applied to new Claims 25 - 29 submitted herein, which are directed to cement slurries containing specific polymers as disclosed in the specification. In particular, Claims 25 - 26



are directed to a cement slurry containing the acrylamide/nonyl methacrylate copolymer designated as HMPAM. Claim 27 is directed to a cement slurry containing the acrylic acid/butyl acrylate copolymer designated as Hb1. Claim 28 is directed to a cement slurry containing an acrylamide/styrene sulfonate copolymer designated as S1 (unbranched) or S2 (branched). Claim 29 is directed to a cement slurry containing both HMPAM and S1 or S2.

### **Lynn**

Lynn is directed to a composition for cement mortars for building material. The composition contains a dispersion that is a polymer or copolymer of a methacrylic or acrylic acid ester. Lynn further defines the preferred dispersion as being a copolymer of an alkyl methacrylate or acrylate and methacrylic or acrylic acid and states that the alkyl methacrylate contains alkyl groups with from 1 to 8 carbon atoms.

Regarding new Claims 25 - 26 and 29, Lynn does not disclose or suggest a cement slurry containing an acrylamide/nonyl methacrylate copolymer.

Regarding new Claim 28, Lynn does not disclose or suggest a cement slurry containing an acrylamide/styrene sulfonate copolymer.

Regarding new Claim 27, Lynn does not disclose or suggest a cement slurry having the particular limitations regarding the Hb1 copolymer of the Claim 27 that it has a weight average molecular weight of between  $10^4$  and  $5 \cdot 10^4$  daltons, that the proportion of acrylic acid units is about 80% and that the copolymer is contained in the cement slurry in a concentration ranging between 0.5 and 5% by weight. Lynn contains no disclosure of the average molecular

weight of its polymers or the proportion of acrylic acid units. With respect to the amount of copolymer used, Lynn specifies that it is 10 to 40% of the weight of the cement.

### **Yamato**

Yamato discloses concrete containing a copolymers resulting from polymerization of (a) a polyalkylene glycol monoester of unsaturated monocarboxylic acid having 110 to 300 mols of oxyalkylene groups of 2 or 3 carbon atoms and (b) at least one monomer selected from an acrylic acid or salt, a dicarboxylic acid or salt, or an acrylomethylsulfonate.

Yamato does not disclose or suggest a cement slurry containing the acrylamide/nonyl methacrylate copolymer of new Claims 25 - 26 and 29, the acrylic acid/butyl acrylate copolymer of new Claim 27, or the acrylamide/styrene sulfonate copolymer of new Claims 28 and 29.

### **Koga**

Koga discloses a cement additive including a sulfonated styrene-maleic acid copolymer of low molecular weight (1,000 to 9,000).

Regarding new Claims 25 - 26 and 29, Koga does not disclose or suggest a cement slurry containing an acrylamide/nonyl methacrylate copolymer.

Regarding new Claim 27, Koga does not disclose or suggest a cement slurry containing an acrylic acid/butyl acrylate copolymer.

Regarding new Claim 28, Koga does not disclose or suggest a cement slurry containing an acrylamide/styrene sulfonate copolymer. Although Koga

discloses a copolymer having styrene sulfonate units, the second unit of the copolymer is required to be a maleic acid derivative. Moreover, the acrylamide/styrene sulfonate copolymer of Claim 28 is required to have a weight average molecular weight of between  $5 \cdot 10^5$  and  $5 \cdot 10^6$  daltons, whereas the polymer of Koga has a number average molecular weight of only 1,000 to 9,000.

### Yamaguchi

Yamaguchi discloses a cement dispersing agent comprising units from (a) an ethylenically unsaturated monocarboxylic acid or salt thereof and (b) an acrylic or methacrylic ester of monohydric alkyl alcohol having 1 - 4 carbon atoms. Further, the dispersing agent has a molecular weight of 1000 to 50000.

Regarding new Claims 25 - 26 and 29, Yamaguchi does not disclose or suggest a cement slurry containing an acrylamide/nonyl methacrylate copolymer.

Regarding new Claim 27, Yamaguchi disclose an acrylic acid/alkyl acrylate copolymer with the alkyl group having 1 to 4 carbon atoms, but does not teach or suggest the use of the composition in a cement slurry for setting in a well bore. To provide a further physical distinction between the slurry of the present invention and that of Yamaguchi, Claim 27 provides that the water/cement ratio of the slurry is 30 %, as disclosed in the examples labeled "Series 2" in the present application. The Examples of Yamaguchi show a water/cement ratio of 50 - 55%, and a ratio as low as 30% is neither taught nor suggested by Yamaguchi

Regarding new Claim 28, Yamaguchi does not disclose or suggest a cement slurry containing an acrylamide/styrene sulfonate copolymer.

**Argillier and Audibert**

Argillier and Audibert disclose the copolymers HMPAM and H1b, but they disclose these copolymers in the context of being useful for filtrate reduction in well fluids, such as drilling fluids, completion fluids or workover fluids. These references do not teach or suggest that the copolymers are useful for cement slurries for cementing well bores. The technical field of well fluids is different from that of cement slurries for cementing well bores such that a person skilled in the art would not apply teachings from the field of well fluids to the field of cement slurries for cementing well bores. On one hand, a well fluid is a suspension of inert particles and cuttings, and the fluid is formulated for circulating up and down through a well bore. On the other hand, a cement slurry for cementing a well bore is a suspension of particles that interact to form a cement that holds the steel casing in place in the well bore. The Argillier and Audibert references do not contain any teaching or suggestion that the compounds disclosed therein would have any usefulness for filtrate reduction in the context of a cement slurry in a wellbore. Accordingly, there would have been no motivation for a person skilled in the art to combine the copolymers of Argillier and Audibert with the cement slurry of any of the preceding references.

Regarding Claims 28 and 29, Argiller and Audibert do not disclose or suggest an acrylamide/styrene sulfonate copolymer

In view of the above, it is respectfully submitted that Claims 25 - 29 would

not have been obvious over Lynn, Koga, Yamaguchi, Yamato, Audibert or Argillier, alone or in any combination.

**Amendments made in response to the Advisory Action of September 25,**

**2003**

The Examiner alleged that the non-entered Claim 22 could be rejected under 35 USC 112, first paragraph, for failing to comply with the written description requirement. In particular, the Examiner alleged that the specification Claim 22 requires the proportion of hydrophilic units (hy) in the Hb1 polymer be about 80%, whereas the specification states that the polymer comprises about 80% acrylate units. In response, the specification is amended to provide that the polymer comprises about 80% acrylic acid units (which are hydrophilic), thereby providing support for the recitation of 80% (hy) units in new Claim 27. This amendment is supported by the specification, because it is clear from the designation of the substituent Z1 as COOH in the Hb1 polymer that (Hy) is intended to be acrylic acid and not acrylate.

The Examiner alleged that the non-entered Claim 22 could be rejected under 35 USC 112, second paragraph, as being indefinite on the alleged grounds that a ratio cannot be expressed as a percentage. In response, new Claim 27 provides that the water/cement ratio is 3:10, as suggested by the Examiner.

The Examiner objected to the disclosure on the alleged grounds that S1 and S2 are not identified as hydrophilic polymers and that the title of the application is restricted to hydrophobic polymers. In response, the specification

is amended to refer to S1 and S2 as hydrophilic polymers. The title is amended to clarify that the application relates to both hydrophobic/hydrophilic polymers and hydrophilic polymers.

Accordingly, entry of new Claims 25 - 29 and the amendments to the specification is respectfully requested.

### **Conclusion**


In view of the foregoing amendments and remarks, it is respectfully submitted that Claims 25 - 29 are in condition for allowance. Favorable reconsideration is respectfully requested.

Should the Examiner believe that anything further is necessary to place this application in condition for allowance, the Examiner is requested to contact applicants' undersigned attorney at the telephone number listed below.

Kindly charge any additional fees due, or credit overpayment of fees, to Deposit Account No. 01-2135 (612.39487X00).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS



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